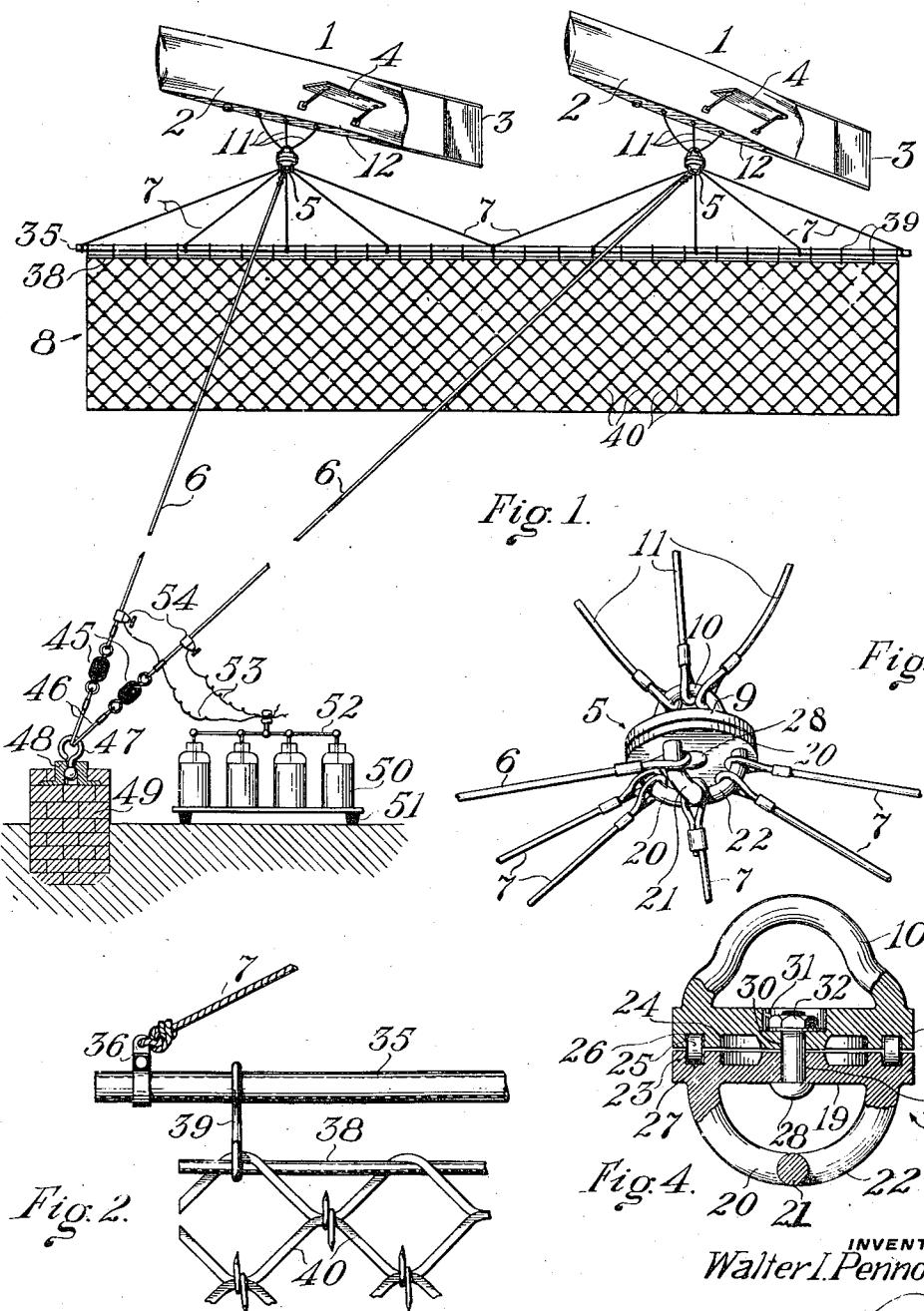


1,014,719.

W. I. PENNOCK.
APPARATUS FOR COLLECTING ELECTRICAL ENERGY.
APPLICATION FILED JAN. 4, 1911.

Patented Jan. 16, 1912.

2 SHEETS—SHEET 1.



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2 SHEETS—SHEET 2.

Fig. 5.

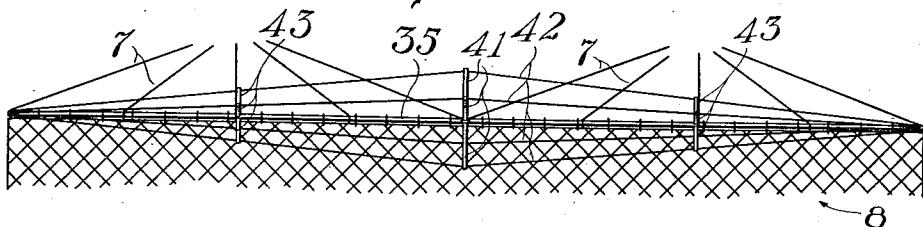


Fig. 6.

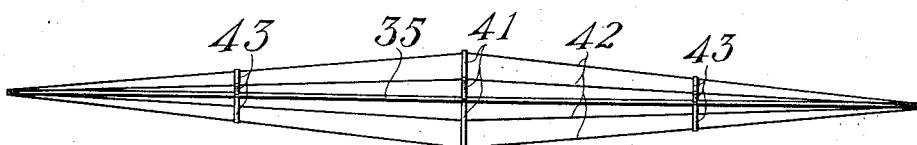
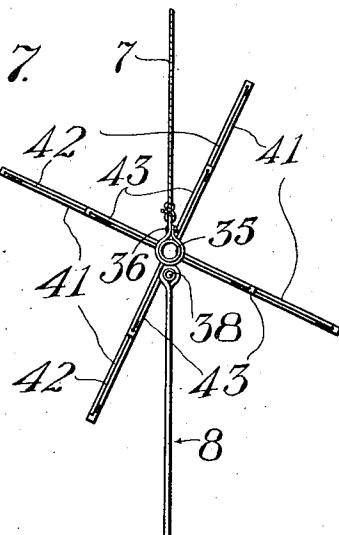


Fig. 7.



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WITNESSES

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UNITED STATES PATENT OFFICE.

WALTER I. PENNOCK, OF PHILADELPHIA, PENNSYLVANIA.

APPARATUS FOR COLLECTING ELECTRICAL ENERGY.

1,014,719.

Specification of Letters Patent.

Patented Jan. 16, 1912.

Application filed January 4, 1911. Serial No. 600,777.

To all whom it may concern:

Be it known that I, WALTER I. PENNOCK, a citizen of the United States, residing at Philadelphia, county of Philadelphia, and State of Pennsylvania, have invented certain new and useful Improvements in Apparatus for Collecting Electrical Energy, of which the following is a full, clear, and exact disclosure.

10 The present invention relates to an improved means for collecting the charges of electricity from the upper atmosphere and more particularly to that form which consists in one or more captive balloons from 15 which is suspended a suitable form of metallic conductor.

The principal objects of the device are: to provide a collector for atmospheric and static electricity, which when in operative 20 position will present a large surface to currents of air, but which will offer comparatively little resistance thereto, to provide a collector of such material and construction as will be more efficient in its operation than 25 any previously constructed for a similar purpose, to provide a means for maintaining such a collector suspended in the air and at right angles to opposing currents thereof, and to provide a suitable anchorage for 30 holding said means captive.

With these principal objects in view, the present invention consists in further advantages which are brought out in the following specification and accompanying 35 drawings, in both of which like numerals refer to like parts, and in which drawings—

Figure 1 is a perspective view of the complete device in operative position, Fig. 2 is an enlarged detail view of the wire mesh 40 and the manner in which it is attached to the supporting balloons, Fig. 3 is a detail of the manner of securing the collector-supporting and anchor cables to the balloons, Fig. 4 is an enlarged cross section of 45 the swivel connection shown in Fig. 3, Fig. 5 is top plan view of the reinforcing braces on the screen, Fig. 6 is an elevation of the same and Fig. 7 is an end view of the structure shown in Figs. 5 and 6.

50 Referring to the drawings, in Fig. 1 there-

of, a plurality of balloons 1 of any suitable type is shown, each of which embodies hollow metallic elongated gas tanks 2, extending from the rear of which are single, rigidly affixed rudders 3, while on the sides 55 of the tanks are secured stationary lifting planes 4.

To the bottom and slightly to the rear of the center of the tanks 2 is secured a suitable swivel 5, by which the anchor ropes 6 60 and the suspension ropes 7 for the metallic conductor 8 are secured to the balloons 1. A suitable form of swivel joint is illustrated in Figs. 3 and 4, but any type can be used that embodies the essential features shown 65 therein.

The swivel joint illustrated consists in the base plate 9 having a looped portion 10 integral therewith and projecting from the upper face thereof. Secured to the loop 10 70 is a set of three light electrically conductive supporting ropes or cables 11 which extend upwardly and are secured at intervals to the bottom 12 of the balloon above.

The lower or revolute member 19 of the 75 swivel joint preferably comprises three upwardly directed curved arms, 20, 21, and 22, respectively, forming at their junction a T-shape as shown, said arms at their upper extremities being integral with the plate 23. 80 The member 19 is revolute below and concentric with the plate 9, and the two members are lightened in weight by opposed concentric grooves as shown at 24. Contact between said members is made through the 85 roller bearings 25, which are carried in the opposed concentric grooves 26 and 27 of the respective upper and lower plates. Furthermore, said plates are maintained in co-operative relation with each other by means of a bolt 28 passing through centrally drilled holes 29 and 30 in the respective lower and upper plates, the drilled hole 30 opening upwardly into an enlarged recess 31, in which is sunken the nut 32 on the bolt 28. Two of 90 the arms 20 and 22 of the lower revolute member 19 extend in diametrical alinement, while from the central point thereof extends the third arm 21 at right angles thereto, and 95 upward to the plate 23.

Suspended below the plurality of balloons is a hollow rod 35, of any suitable material, connected at regular intervals such as at points 36, by metallic ropes 7, to the aligned arms 20 and 22 of the swivel joint 5. Below and parallel to the rod 35 is a similar but smaller rod 38 suspended therefrom by means of suitable couplings 39. From the rod 38 hangs a wire mesh 40 of any suitable form, such as can be extended over a considerable area and which will offer comparatively little resistance to the passage of air therethrough. The metal in such a screen is preferably rough, sharp or jagged and a convenient form embodying these characteristics is expanded sheet metal such as is used for lathing and for reinforcing concrete construction. Instead of the single hollow rod 35 alone, applicant contemplates the use of reinforcing means to prevent the buckling of the rod in a stiff wind, such, for instance, as the arrangement of wire bracing shown in Figs. 5, 6 and 7 in which cross rods 41, secured to the rod 35 at the center thereof are attached to the ends thereof by means of stretched wires 42. Between the rods 41 and the ends of the rod 35 are secured sets of cross rods 43 which support the wires 42 and strengthen the rod 35 at as many points as they may be placed.

For the purpose of maintaining the balloons and apparatus suspended therefrom captive, the light metallic cables 6 terminating downwardly in insulators 45 are employed. These insulators in turn are connected by means of short sections of rope 46 to the eye 47 of a suitable swivel 48, embedded in the anchorage 49.

When the balloons with the metallic screen suspended therefrom are allowed to rise into one of the higher altitudes, the entire apparatus being of metallic construction and uninsulated will become energized by contact with the surrounding natural charges of electricity. From the above description it is evident then that, while the screen 8, on account of its great extent, will be the greatest collecting agent, it will be seen that the balloons themselves and the suspending wires will also coöperate as one large collector, since no parts of which are insulated from any of the neighboring parts thereof. Consequently, when the apparatus described has reached an altitude or strata 55 of the atmosphere abounding in static charges of electricity, an amount of the said charges proportionate to the surface area of the metal exposed will collect upon the apparatus as a whole and will be conducted downwardly toward the earth by means of the various anchor ropes 6, but will not pass into the ground on account of the interposition of the insulators 45.

To use the electrical charges thus acquired, a plurality of Leyden jars 50, or other suitable collectors are supported above the surface of the earth and insulated therefrom by any suitable means as represented by the blocks 51. Either the inner or outer conducting surfaces of the jars may be connected together and energized by the accumulated charge. In the present instance, the inner surfaces of the accumulators are shown to be connected, and the connecting means 52 is in turn connected to the ropes 6 by means of wires 53. These wires are secured to the ropes mentioned by means of suitable binding posts 54.

In the device described the anchor ropes 6 are of substantially the same length, and when the apparatus is raised to the desired altitude and is being blown by the currents of air, the balloons are turned by means of the vanes 3 to parallel relation with each other, and furthermore, from the manner in which the device is held captive and the collecting net 40 is suspended from the balloons, it is obvious that said net will at all times readily swing into a plane substantially perpendicular to any current of air acting upon the balloons above. The purpose of the swivel joint shown in Figs. 3 and 4 is principally for allowing the balloons to readily aline themselves with any new direction of the wind before the apparatus, including the suspended screen, can swing about the swivel 48, and said joint will also prevent the twisting of the ropes 7, when any rapid shifting of the air currents may occur.

While applicant has shown a set of Leyden jars as the accumulators in the accompanying drawings, it is obvious that any other suitable form may be used, and furthermore, that although not illustrated, any suitable apparatus may be run thereby, such as for instance, wireless telegraphic instruments.

Furthermore, although but one embodiment of the invention has been described, it is to be understood that various modifications may be made therein, and in fact several are contemplated by applicant that are of such structure as fall well within the scope of the appended claim.

Having thus described my invention, what I claim and desire to protect by Letters Patent of the United States, is:

A collector for charges of electricity, comprising a plurality of supporting means, a metallic gauze sustained thereby to lie in a plane and substantially equidistant from each of said supporting means, anchoring means emanating from a common point to each of said supporting means, means operative to maintain said supporting means

in their normal positions, and means between each of said supporting means and said gauze to permit each of said supporting means to readily and independently aline itself to accord with any alteration in
5 the direction of opposing air currents.

In witness whereof I have hereunto set

my hand this 28 day of December, A. D.
1910.

WALTER I. PENNOCK.

Witnesses:

MILDRED S. TEMPLE,
E. EUGENIA PENNOCK.